

NWS FORM E-5 COMMERCE	U.S. DEPARTMENT OF NOAA, NATIONAL WEATHER	HSA OFFICE: <b>San Juan, PR (SJU)</b>
SERVICE		REPORT FOR (MONTH / YEAR): <b>May, 2004</b>
<b>MONTHLY REPORT OF RIVER AND FLOOD CONDITIONS</b>		DATE: <b>June 9, 2004</b>
TO: NATIONAL WEATHER SERVICE HYDROMETEOROLOGICAL INFO CENTER, W/OS31 SSMC 2 – Room 13468 1325 EAST-WEST HIGHWAY SILVER SPRING, MD 20910-3283		SIGNATURE: Peter Corrigan
When no flooding occurs, include miscellaneous river conditions, such as significant rises, record low stages, ice conditions, snow cover, droughts, and hydrologic products issued (WSOM E-41).		

**Summary:** May was substantially wetter than normal in Puerto Rico and the U.S. Virgin Islands, with several flood events and numerous water related problems, including mudslides and one known flood death. Total damages are unknown at this time. May rainfall at San Juan was 9.39" or 4.10" above normal and precipitation was especially heavy over the north central and northeast parts of Puerto Rico, with nearly twice normal rainfall at a number of cooperative observer locations.

May began in typical fashion for Puerto Rico and the U.S. Virgin islands, with scattered convection across the island and pockets of heavy rainfall. A heavy shower occurred during the afternoon of the 2<sup>nd</sup> over Guaynilla and Yauco municipalities in the southwest, which prompted issuance of an Urban/Small Stream Flood Advisory. Radar estimates of over two inches of rain were corroborated by the 24-hour gage total of 2.43" at Lago Luchetti (LLUP4). The convective activity became substantially more widespread on the 3<sup>rd</sup>, with 24-hour rainfall totals reaching 3.70" in the upper Rio de la Plata basin near Aibonito (AIBP4). There were widespread 1 to 2 inch rains over the eastern 1/2 of the island. The activity persisted through much of the 4<sup>th</sup> and affected the island of St. Croix as well, with radar estimating 1 to 2 inches. An Urban/Small Stream Flood Advisory was issued for that island as there were reports of water ponding on roadways. 24-hour rainfall totals ending at 12Z on the 5<sup>th</sup> reached 5.44" at Proyecto La Plata near Aibnito (AIBP4); 3.31" at Rio Bayamon at Arenas (CIFP4); 2.96" at La Plaza (CAIP4); 2.91" at San Lorenzo (ZGBP4) and 2.32" at Rio La Plata at Guayate (ZEAP4). Moderate shower activity persisted during the morning hours of the 5<sup>th</sup> over eastern Puerto Rico and rivers in this area reached record high flows for the date on the 5<sup>th</sup>, including Rio de la Plata at Proyecto la Plata (54.8 mi<sup>2</sup> basin ) which reached 2,520 cubic feet per second (cfs), Quebrada Arenas in the upper Loiza (1,070 cfs in 6.0 mi<sup>2</sup> basin); and the Rio Grande de Loiza at Caguas (4520 cfs in 89.8 mi<sup>2</sup> basin).

A mostly dry day on the 6<sup>th</sup> was followed by a renewed period of widespread convection and shower activity from the 7<sup>th</sup> to 9<sup>th</sup>, which produced some significant flooding. The stage was set by a significant increase in moisture, as the 00Z sounding on the 8<sup>th</sup> showed precipitable water of 2.01". This moisture, in combination with a weak shortwave and strong convergence along the northern slope of the mountains, produced quasi-stationary rainfall over parts of northern Puerto Rico. Urban and Small Stream Flood Advisories were issued for numerous

municipalities in the northwest on the afternoon of the 7<sup>th</sup>, which was followed by another such advisory for north central counties from Canovanas west to Guaynabo. Rainfall estimates produced by the Satellite Analysis Branch of NESDIS suggested rain rates of 1.5 to 2 inches per hour. As the convection drifted east with time, another advisory was issued for the San Juan area and municipalities west to Manati. The heavy afternoon rainfall pushed the Rio Grande de Loiza below Caraizo Reservoir above flood stage from Trujillo Alto downstream to Loiza, and a Flood Warning for Loiza and Rio Grande was issued. Flood Watches were issued late on Friday the 7<sup>th</sup> for the Rio Cibuco basin, as the heaviest rains fell over this watershed during the day. 24-hour rainfall totals ending at 12Z on the 8<sup>th</sup> included 3.29" at Canaboncito (CAHP4); 2.59" at Rio Bayamon below Lake Cidra (CIEP4); 2.57" at Barrio Beatriz (BZDP4); 2.37" at Lago Cidra (DRAP4) and 2.30" at Orocovis (RORP4).

The rainfall persisted during much of the day on the 8<sup>th</sup> along the central mountain ranges, prompting the issuance of first a Flood Advisory and then a Flash Flood Warning for Ciales, Jayuya, Adjuntas, Utuado and Lares. Gages on several small basins exceeded flood stage quickly. A Flash Flood Warning for Manati was issued later in the evening as the Rio Grande de Manati left its banks. River Flood Warnings for both this river and the Rio Grande de Arecibo were required later in the evening as flooding became significant. There was a report from Puerto Rico Emergency Management (PREMA) that the water was four feet over the spillway at Lagos dos Bocas reservoir, which is part of the Rio Grande de Arecibo basin. PREMA later reported that the Rio Tanama was passing over low bridges in the Arecibo municipality. The Rio Grande de Manati crested well above its flood stage of 25 feet, reaching 29.6 feet very late on the 8<sup>th</sup>. The Rio Grande de Arecibo also exceeded Moderate Flood Stage, cresting at 13.75 feet (FS = 11 feet) late on the 8<sup>th</sup>. The heaviest 24-hour rains were concentrated in the Rio Grande de Manati and Rio Grande de Arecibo river basins and amount ending at 12Z on May 9 were 5.23" at Boca Grande near Jayuya, 5.06" at Rio Caonillas at Paso Palma; 4.75" at Rio Jauca at Paso Palma; 4.69" at Adjuntas (ZCAP4); and 4.53" at Cerro la Mira near Utuado.

By Sunday morning the 9<sup>th</sup> a Flood Watch was issued for the entire island and the U.S. Virgin Islands, as the continuous stream of showers moved east to west across the northern 1/3 of the island. Showers became especially intense over the northeast during the morning and a Flash Flood Warning was issued for four municipalities in that area. This warning was extended later in the day as radar estimated up to 4 inches had fallen in some areas. The persistent steady rainfall produced additional flooding late in the day in parts of the Rio Cibuco basin, and a Flash Flood Warning was issued for Vega Alta and Vega Baja. PREMA reported the Rio Cibuco well out of its banks and flooding at least 5 roads across these municipalities, including a major east-west highway, Route 2. This report was later confirmed by an off-duty NWS employee and several cars were later rescued from the flood waters. Several landslides were also reported by PREMA, at least one affecting homes. Flood Warnings were extended through the morning hours for the Rio Cibuco, which crested nearly a foot over flood stage. Fortunately, for the rain-soaked central river basins the heaviest overnight rainfall was centered in parts of eastern Puerto Rico. An Urban and Small Stream Flood Advisory was issued for Canovanas, Carolina, Trujillo Alto and Rio Grande. Several small streams were reported to be out of their banks in this area. 24-hour rainfall totals were impressive, including 7.76" at Rio Canovanas in Campo Rico (CNAP4); 6.37" at Rio Cibuco below Corozal (CORP4); 4.65" at Rio Piedras Alert site (ZFBP4); 4.51" at Corozal 3WSW (CRZP4); and 3.90" at Rio Guadiana near Naranjito (NAMP4). The Canovanas amount had about a five-year return frequency according to NWS Technical Paper 42.

Although there was considerable drying on the 10<sup>th</sup>, scattered rainfall still occurred over much of the island, with over an inch in the southeast and 0.25 to 0.50" in many of the saturated central basins. Shower activity became more widespread again on the 11<sup>th</sup> and there were numerous reports of mudslides, road closures and at least one bridge washout in the Utuado and Arecibo. For the 24-hour period ending 12Z on the 12<sup>th</sup>, Rio Cibuco below Corozal (CORP4) had 3.46"; Rio Piedras-Alert (ZFBP4), 3.39"; Lago La Plata (NARP4), 2.99"; Rio Canovanas at Campo Rico (CNAP4), 2.97" and Las Curias at Cupey (RPAP4), 2.38".

The remains of a low-level boundary and associated convergence maintained the threat of shower activity over the north central river basins, prompting the issuance of another Flood Watch during the morning hours of the 12<sup>th</sup>. This was for areas that had received anywhere from 3 to 10 inches of rain in the previous three days.

By mid-afternoon convection over the northwest required issuance of an Urban and Small Stream Flood Advisory for twelve municipalities, where rainfall was estimated at 2 to 4 inches in an hour on radar. A Flash Flood Warning was later issued for Rio Grande municipality where rain was falling over highly saturated soils. The torrential rains moved west into the western parts of the San Juan metro area and a Flash Flood Warning was then issued for four additional municipalities.

Another Flash Flood Warning was issued for Moca and San Sebastian in the afternoon as up to 4 inches of rain was estimated across this area and a spotter reported flooding along the upper Rio Culebrinas. The continued training of cells producing 2 to 3 inches per hour of rainfall across very wet areas of north central Puerto Rico produced numerous landslides and reports of flooded roadways. A Flash Flood Warning for 16 municipalities, including the entire San Juan metro area was issued at 326 PM and reports of urban flooding and extreme traffic problems due to high water were received. Later flood reports described many roads closed due to flooding or landslides in Caguas, Aguas Buenas and Trujillo Alto. Up to 60 persons were forced out of their homes due to the mudslides in these areas. The Rio Cibuco in Vega Alta was reported by PREMA officials to be covering Highway 620 in Barrio Candelaria. The strong upper-level dynamics (100 to 130 knots at 200 mb) remained in place during the overnight hours of the 12<sup>th</sup>, producing nocturnal thunderstorm activity over parts of eastern Puerto Rico which persisted into the mid-morning hours. An Urban and Small Stream Advisory was issued for 5 municipalities from Rio Grande west through San Juan. The action extended back into the U.S. Virgin Islands to include Vieques and Saint Croix in a Flood Advisory as well. 24-hour rainfall totals ending at 12Z on the 13<sup>th</sup> reached 4.39" at Rio Grande at El Verde (VERP4); 4.26" at Rio Canovanas at Campo Rico (CNAP4); 4.09" at Lago Las Curias (RPCP4); 3.73" at Rio Grande de Loiza at Quebrada Arenas (SLLP4) and 3.20" at Las Curias in Cupey (RPAP4).

The 12Z sounding for May 13<sup>th</sup> looked fairly ominous with ample moisture of 1.85 inches precipitable water and an unstable atmosphere (K index of 38). A Flood Watch was issued for basically the eastern one-half of the island, and later in the morning for Saint Croix. In addition, forecasters issued a Hydrologic Outlook (ESFSJU) for possible severe flooding persisting for several days and culminating on the 15<sup>th</sup>, when a large increase in low level moisture was forecast across the island. Clusters of showers and thunderstorms moved ashore into eastern Puerto Rico by mid-morning on the 13<sup>th</sup> and a Flash Flood Warning was issued for 11 municipalities in the east by 748 AM. Despite all indications of a repeat episode, an intrusion of drier air near 700 mb caused a diminution of shower activity across the island resulting in cancellation of the Flood Watch by mid-afternoon. A number of stations in the east still had 24-hour rainfall in excess of 2 inches for the 24 hours ending 12Z on the 14<sup>th</sup>.

A new Flood Watch for flash flooding was released early on the 14<sup>th</sup> as many of the same factors responsible for the activity earlier in the week remained in place,

including substantial low level moisture (PW – 1.86”), a 100 knot upper jet and an unstable atmosphere. By mid-morning an Urban/Small Stream Flood Advisory was issued for 10 municipalities in the northern part of the island and San Juan metro areas, which was followed by a Flash Flood Warning for portions of the metro area. The intense rains again produced widespread urban flooding in and around the city of San Juan. Later in the day a Flood Warning was issued for the Rio Grande de Loiza and Rio Gurabo for locations above Carraizo Reservoir. The river gage at Caguas (89 mi<sup>2</sup> basin) rose from near 6 feet (400 cfs) at 1600Z, cresting at its Flood Stage of 16 feet (14,700 cfs) in about 3 hours. Far southwest sections of the island also experienced heavy rainfall later in the day, requiring an Urban/Small Stream Flood Advisory. Flash Flooding also hit the island of St. Croix during the evening of the 14<sup>th</sup>, and both St. Thomas and Saint John had heavy rainfall later that night. 24-hour rainfall across Puerto Rico and the U.S. Virgin Islands was heaviest in the north and central areas of Puerto Rico, measured over 2.50 inches in the 24 hours ending 12Z on the 15<sup>th</sup>.

The highly unstable, moisture-rich environment persisted into the 15<sup>th</sup> and 16<sup>th</sup> and Flood Watches for Flash Flooding were maintained throughout most of both days. The San Juan metro area was hit again by flash flood producing rainfall during the late morning hours of the 15<sup>th</sup>, with 2 to 4 inch amounts falling in a 1 to 2 hour period. There were several reports of flash flooding around the metro area. The NWS forecast point on the Rio Piedras at Hato Rey (15 mi<sup>2</sup>), crested at 19.1 feet, above its Major Flood Stage of 18 feet as the river rose over 13 feet in 1.5 hours, with discharge increasing from 76 to 7,200 cfs in 1.5 hours. Urban/Small Stream Advisories were put out during the afternoon for portions of the north central island and over the southwest due to radar estimates of 2 to as much as 5 inches of rainfall. 24 hour gage rainfall ending 12Z on the 16<sup>th</sup> included 3.66” at Rio Piedras – El Senorial (RPEP4); 3.15” at Rio Icacos near Naguabo (NGIP4); 2.71” at Lago Las Curias (RPCP4); and 2.36” at Lago La Plata (NARP4). Activity was considerably diminished on the 16<sup>th</sup>, with only one Flash Flood Warning required in the afternoon, issued for the Rio Guanajibo in southwest Puerto Rico

By the 17<sup>th</sup> there was noticeable decrease in moisture (12Z PW of 1.39”) and a shift in dynamic forcing to the south resulting in the driest day in at least a week over Puerto Rico. Strong storms formed over southwest Puerto Rico in the afternoon of the 18<sup>th</sup>, with rain falling primarily in the Rio Guanajibo basin. Hormigueros (MAYP4) had 2.51” in about 2 hours and Rio Guanajibo at San German (GSPP4) 1.80” in the same period. The Rio Guanajibo rose over Action Stage, cresting at 11.2 feet (3780 cfs) in about 1.5 hours. A flood death occurred when a car stalled crossing a flooded bridge over Quebrada Los Sosa on Highway 103 and the victim, a 60-year old man drowned trying to escape.

More shower and scattered thunderstorms affected the San Juan area on the 19<sup>th</sup>, with 1 to 2 inches amounts accompanied by minor flooding. Urban/Small Stream Advisories were in effect for much of the afternoon across the north central parts of the island. Radar also estimated 3 or more inches of rain over parts of the southwest and central interior island, with more minor flooding reported. A large area of deeper moisture began moving back north into the San Juan CWA on the 19<sup>th</sup> and 20<sup>th</sup> as precipitable water increased from 1.6 to over 2 inches by the evening of the 19<sup>th</sup>. More activity developed over the far southwest on the 20<sup>th</sup>, requiring yet another Flood Advisory for six municipalities. In addition, a Hydrologic Outlook was issued during the afternoon of the 20<sup>th</sup> for the possibility of heavy rain and attendant flooding on for the period May 21-23. By the afternoon of the 20<sup>th</sup>, radar was showing over 5 inches of rain in small area north of San German in the Rio Guanajibo basin, and a Flash Flood Warning was issued for Hormigueros and San German municipalities. The rain gage at Sabana Grande (ZOBP4) in the

upper Guanajibo measured over 5 inches in 3 hours. Later reports were received that the Rio Guanajibo in San German flooded road 114 and four people were rescued from a vehicle trapped in the flooding. A river Flood Warning for the Guanajibo downstream at Hormigueros was also posted and the river crested nearly a foot over flood stage. Emergency officials reported the river flooding road 340 near the river. The upper level trough responsible for the wet pattern remained in place on the 20<sup>th</sup>, despite a slight decrease in moisture and a Flood Watch was again posted for Puerto Rico. This watch remained in effect for most of the next 4 days as copious moisture remained across the area (PW ranged from 2.26 to 2.41" on the 23<sup>rd</sup> and 24<sup>th</sup>). In addition, a weak area of low pressure moved west of Puerto Rico, producing southerly flow across the island. During the overnight and early morning hours of May 22-23, 34 municipalities were covered by Urban/Small Stream Flood Advisories as widespread 1 to 2 inch rains fell over the central highlands and northeast. Very heavy rain developed in the late morning hours of the 23<sup>rd</sup> across the San Juan metro area again, persisting for several hours and producing widespread urban flash flooding. This prompted a Flash Flood Warning for San Juan as numerous roads were inundated and the Rio Piedras went into flood for the third time this May. It ultimately crested at 20.70 feet which is the 2<sup>nd</sup> highest on record, following Hurricane Hortense in 1996 (22.11 feet). There were up to 60 evacuations reported from a housing development near the river and several major roads impacted. A Flash Flood Warning for the Rio Loiza below Carraizo Reservoir was also issued as water from the river reached the parking lot of Roberto Clemente stadium in Carolina. An Urban/Small Stream Advisory was also issued for another 10 municipalities in the northeast part of the island in the late afternoon. Scattered heavy shower activity focused over the elevated terrain of the interior southwest over the eastern half of Puerto Rico on the 24<sup>th</sup>, requiring several Urban/Small Stream Flood Advisories. 24-hour rainfall reached 5.29 inches at Barrio Saltillo near Adjuntas (ADSP4) over 3 inches in the basins above Ponce. These locations had not received a great deal of rainfall during May so far, so flood problems were minimal. Despite up to 3.5 inches of rain over parts of northwest Puerto Rico on the 26<sup>th</sup>, no flood products were issued for the first time in quite a while. An Urban/Small Stream Advisory for 5 municipalities in the central mountains was issued on the 27<sup>th</sup> and was the last flood product issued in the busy month of May

#### Non-Routine Hydrologic Products Issued:

Hydrologic Outlooks (SJUESFSJU): **2**  
 Flood Watches (SJUFFASJU): **15**  
 Flood Warnings (SJUFLWSJU): **15**  
 Flash Flood Warnings (SJUFFWSJU): **112**  
 Urban/Small Stream Flood Advisories (SJUFLSSJU): **336**

cc: USGS Caribbean District  
 USCE Jacksonville Division  
 SRH Climate, Weather and Water Division  
 SERFC  
 NWS Hydrologic Information Center  
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Fig. 1

